Name_____

This is Harold Kaplan's first project in SM162. It is handed out Friday 21 January 2005. It is due back Friday 28 January 2005, in class on paper, not e-mailed. A project is like an hour test and must be completed without help from anybody except Harold Kaplan. Kaplan will help in class, but not in extra instruction. You may use your own notes and any commercially prepared materials you choose. For each problem, hand in printouts (or pencillings) of program and answer and graph. For approximate integrals, explain why you think "n" is big enough. Each answer ought to go on the same paper as its program. The programs ought to have blank lines and indentation to show structure. Use `formatlong()` in every Lua program that prints an answer. Use the "ax" on each program, so it has no lines but those necessary. Using calculus is permitted.

1 This physicist rushed up to me, and he says he needs the value of the sine integral for $x = 5$, and he cannot tolerate an error greater than one over two million. The sine integral is defined to be $\int_0^x \frac{\sin t}{t} dt$. When t is exactly zero, that integrand is taken to be 1, because the limit would be 1. Write and run a Lua program to get the value of the physicist's integral. That program will of course include a function definition for the integrand. That definition will have to have an `if` statement to handle the case where `t==0`. The number n of times around the loop will have to be worked with the help of Maple. Hand in the Lua program and the Maple worksheet and the final answer. Be sure to label everything so the physicist will see what happened, in case he has to explain it to another physicist. Smaller values of n (the number of steps) will tend to get higher scores from me, but the reasoning must be sound.

2 Build a hash table called y, and put $\sin(j)$ into y_j, where j shall go from 1 to 100. Then sort the values in the y hash table by using `table.sort(y)` as we did in the homework. Then write a function called g depending on j which will return y_j. Then make a graph of the g function. Write and run a Lua program to do all this.

Hand this question sheet in with the answer sheets.